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Low Background Radiation Experiment Yields Interesting Preliminary Results

CARLSBAD, N.M., May 18, 2011 – New Mexico State University's Low Background Radiation Experiment (LBRE), which takes place 2,150 feet below the earth's surface at the Waste Isolation Pilot Plant, recently released some results about the project's first two years of experimentation.

The March 2011 edition of *Health Physics* printed an article titled "Exploring Biological Effects of Low Level Radiation from the Other Side of Background," summarizing some initial data taken from LBRE and from a sister experiment conducted at the Lovelace Respiratory Research Institute in Albuquerque.

"It's nice that we got them published, but they are still very preliminary," said NMSU Professor Geoffrey Smith, the project lead. "It's a tremendous challenge to pick up the subtle small effects of growing cells in the absence of radiation."

"That's why there is such uncertainty about whether low levels of radiation are harmful or not," noted Roger Nelson, chief scientist of the Department of Energy's Carlsbad Field Office. "It's really hard to measure the effects at low levels. Why, for all we know, low level radiation might even be beneficial for living organisms."

Smith's experiment involves placing two types of bacteria in the WIPP underground, where levels of natural background radiation are extremely low. Life forms are exposed to background radiation from a variety of sources daily, including the sun.

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The test is to see whether exposure to “less than average” radiation will be a benefit, a detriment or have no effect on the life forms. The transuranic waste emplaced at WIPP, the U.S. Department of Energy’s underground repository near Carlsbad, in no way interferes with the experiment.

The project is about to begin its third year, with Smith and two NMSU students conducting the research at WIPP.

“I really enjoy the work out there,” Smith said. “Spending summers sweating it out in the underground is actually a great break.”

The *Health Physics* article was submitted by Smith, Yair Grof (Soreq Nuclear Research Center), Adrianne Navarrette (Carlsbad Environmental Monitoring and Research Center) and Raymond Guilmette (Lovelace Respiratory Research Institute). The two experiments seek to test the Linear No-Threshold model of radiation dose-response, which assumes that a single ionizing radiation interaction with a cell is dangerous.

Results so far, as reported in the *Health Physics* article, indicate that the cell growth of the bacteria in the WIPP underground, exposed to less background radiation than the control group, is hampered.

“Initial results from June 2010 show … the growth of ‘radiation starved’ cells are (sic) inhibited compared to cells grown in the presence of background radiation levels,” the researchers reported.

“The noise in the data is still fairly high,” Smith clarified. “It’s preliminary, and we still need more data to show it as statistically different.”

The experiment has changed slightly over the past three years. During the first year, Smith’s control group involved growing the same cultures of bacteria above ground, where they would be exposed to normal amounts of radiation. In the second year, the control group of bacteria was cultivated in the WIPP underground, but radiated to simulate background radiation.

“This year, we’re going to do both and double the control treatments,” Smith said. “We’re also working to increase the sensitivity of our tests and decrease the amount of experimental noise.”

Guilmette's experiment at the Lovelace Respiratory Research Institute has yielded similar preliminary results to the experiment at WIPP, the researchers reported. Instead of using the WIPP underground, the Lovelace experiment uses shielding to reduce background radiation exposure for one group of cells. However, shielding at the surface cannot reduce the radiation levels to much less than about a third of that of natural background. Getting close to zero background radiation requires an experiment underground in a salt mine with no naturally radioactive minerals in the rock.

The WIPP is a U.S. Department of Energy facility designed to safely isolate defense-related TRU waste from people and the environment. Waste temporarily stored at sites around the country is shipped to WIPP and permanently disposed in rooms mined out of an ancient salt formation 2,150 feet below the surface. WIPP is located 26 miles southeast of Carlsbad, N.M.

Photo Caption: Tana Saul and Professor Geoffrey Smith conduct research during the summer of 2010 in an underground laboratory at the Waste Isolation Pilot Plant. The Low Background Radiation Experiment will soon begin its third year.

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